shows clearly that we are dealing with a chemical reaction. We must, therefore, exclude the interpretation that diffusion is the determining factor.[7]

Another suggestion is that the result is due merely to the fact that the majority of the cells are more accessible to the reagent or less resistant to it than the rest, so that more cells are killed in the first minute than in the second and so on. But if this were the case we could not, after a lapse of ten minutes (when the loss of resistance already amounts to 125 ohms), restore the tissue to its initial resistance by replacing it in sea-water. This can be done and there is no evidence that the tissue is in any way injured by such treatment with NaCl.[8] The same piece of tissue may be treated with NaCl (for five minutes) and replaced in sea-water several times each day for ten days in succession without showing any sign of injury.[9]

This leads us to the following conclusion. Since the effect of NaCl is within wide limits completely reversible, without production of injury, *the conception of the chemical dynamics of living protoplasm here developed applies not only to reactions which produce death but also to reactions which involve no injury and which form a normal part of the activity of the cell.* This conclusion is fully confirmed by experiments with a variety of other substances.

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[7] There are other important reasons opposed to the suggestion that diffusion is the determining factor. One of these is the length of time required for the process. If tissue is transferred from sea-water to sea-water diluted with one or two volumes of distilled water, there is a change of resistance which continues until equilibrium has been restored by diffusion. This process at 18° C. does not take more than ten minutes, whereas nearly three hours would be required for the reaction with NaCl which we have been measuring.

[8] This and other experiments show that the increase in the conductivity of the protoplasm is not to be attributed to an increase in the concentration of electrolytes within the cell but rather to a decrease in the viscosity of the protoplasm (or to an increase in some other factor which facilitates the passage of ions).

[9] Science, N. S., 36: 350, 1912.

The American Association for the Advancement of Science

Section H—Anthropology and Psychology

At the recent annual meeting of the American Association for the Advancement of Science held at Atlanta, Georgia, December 29 to January 2, Section H—Anthropology and Psychology—participated in four sessions. Tuesday afternoon was devoted to a "general interest" session at which Professors Max Meyer and Lightner Witmer spoke. Wednesday morning was given over to a joint meeting with the Southern Society for Philosophy and Psychology; Thursday morning to a joint session with Section L—Education, and Thursday afternoon to a joint session of all three of these organizations. In all some twenty-two papers were presented.

The following officers were elected: *Vice-president of the Association and Chairman of the Section,* Dr. Clark Wissler, of the American Museum of Natural History; *Member of the Sectional Committee* (to succeed Dr. G. A. Dorsey), Professor Lightner Witmer, of the University of Pennsylvania; *Member of the Council,* Professor Max Meyer, of the University of Missouri; *Member of the General Committee,* Professor L. R. Geissler, of the University of Georgia.

The following twelve papers were presented under the auspices of Section H:

The Present Problems of Physiological Psychology: Max Meyer.

Psychologists generally are beginning to realize that the study of consciousness is only a secondary, an auxiliary branch of psychology. But it is a mistake to think that psychology can be defined simply as the study of behavior. The study of plant behavior is the business of the botanist. Nothing forbids, of course, interest in plant behavior on the part of the psychologist save common sense, which would call a man a botanist if he is more interested in plant behavior than in human life. In a similar way the study of animal behavior must be regarded as primarily the task of the zoologist. And the study of human behavior seems to be largely the province of the sociologist (including under "sociology" as a special branch the science of education). Is then

nothing left for the psychologist as his proper field? My answer is that it is the psychologist's business to make comprehensible that link which is interposed between our sensory surfaces and our muscles, the function of the nervous system. Apparently, this demand is supplied by a scientist who, again, is not the psychologist—by the physiologist. As a matter of fact, however, a text-book on the physiology of the nervous system, even such as Sherrington's or Loeb's, would not suit the needs of a college class in psychology. I should say, therefore, that the psychologist's task consists in making comprehensible the function of the nervous system as the chief determiner of all those varied forms of human behavior which we find described in a good novel, in the drama, in biography, in history, in the newspaper. In order to illustrate this task, a number of typical problems were discussed and solutions proposed.

Children with Mental Defects Distinguished from Mentally Defective Children: LIGHTNER WITMER.

"Were society so organized that success in life in every sphere of activity were dependent upon a good enough ear to turn a tune, many persons who are now doing useful work in the world would have to be relegated to the class of imbeciles." Several cases were reported, among them the case of a boy who at fourteen years, although he was normal in appearance and behavior and had been attending school regularly, was at the educational stage of a child of seven. He was unable to read for himself, for pleasure or profit, and his spelling was as deficient as his reading. When he wrote a letter it was impossible to make out his meaning without knowing what he had intended to say. Careful examination showed that the boy was suffering from a language defect, psychologically a defect of memory. There was both a weakness in retaining new impressions and a weakness in the recall of impressions which had been received and partially retained. He was word deaf as well as word blind, or, to put it scientifically, he was a case of congenital aphasia. "Congential aphasia is a more serious defect to the individual than the lack of an ear for music, because of the social and industrial importance of speech; perhaps also because a certain measure of language development is essential for accurate thinking. . . . I regard the child, for that matter the adult also, as composed of a number of traits, some of them assets if they favor normal mental development and success in adult life; some of them defects if they provoke retardation, arrested development, delinquency and crime. There is no so-called normal person who does not possess some defects along with his assets. The type of child in whom I am especially interested and for whom I organized and am directing the work of the psychological clinic at the University of Pennsylvania, is the child who has so many and such severe mental defects as seriously to interfere with normal development in the home and in the school and to prognosticate his arrival at adult age arrested in mental and moral development. Because a child has one or a few mental defects, we must not characterize him as mentally defective. . . . A strictly scientific nomenclature will dispense with the term 'mentally defective,' as failing to characterize with sufficient definiteness the class of children under consideration. What characterizes 'mentally defective' children is not that they are mentally defective, for other children, in fact all children, are mentally defective, but that they are so defective mentally as to be socially unfit. For the term 'mentally defective' I would therefore propose substituting the term 'socially unfit' or 'socially defective.'"

Published in *The Psychological Clinic,* Vol. VII., No. 7, December 15, 1913.

Some Fundamental Concepts in Social Psychology: L. R. GEISSLER. (By title.)

Correlation of Mental and Physical Measurement: JASPER C. BARNES.

The correlations described in this paper are based upon the physical measurements of one hundred students, members of the psychology class in Maryville College, during the year of 1912–13 and the fall term of 1913. The list includes fifty young men and fifty young women representing all of the four college classes and twenty different states. The average age of the young men was 21.7 years, while the average age of the young ladies was 21.3 years. The youngest in each case was 17. The oldest young man was 26, and of the young ladies 31. The mental measurements are in terms of grades received by the students in their various studies, and hence are not mental measurements in the laboratory sense at all. The physical measurements were five: height, weight, vital capacity, length and width of head. The apparatus used was the stadiometer, anthropometric scales, wet-spirometer and head calipers.

According to the method of group comparison there seems to be very little relation between height and scholarship, or weight and scholarship. But between the vital capacity and mental abil-

ity there appears to be some correlation by the method of comparison, yet when computed by Pearson method the index of correlation is very small. The coefficients of correlation calculated by the Pearson method are as follows:

	Men	Women
Weight and class standing.....	.056	.052
Height and class standing.....	.023	.216
Vital capacity and class stdg....	.085	.245
Cephalic index and class stdg....	—.033	—.151

In summing up the foregoing, it appears that the measurements in this series have little interdependence.

The index of correlation except in the case of the vital capacity of women, is a negligible quantity. However, the number of cases is too small in our investigation to justify the statement of any general conclusion or law. It may be said, nevertheless, in the hundred cases studied, there seems to be little, if any, correlation between mental ability, as shown by class standing of college students, and height, weight, lung capacity and cephalic index.

The Causes of the Declining Birth-rate: J. McKeen Cattell.

The completed family of contemporary scientific men is about 2, the surviving family about 1.8 and the number of surviving children for each scientific man about 1.6. Twenty-two per cent. of the families are childless; only one family in seventy-five is larger than six. The same conditions obtain for other college graduates. The speaker discussed the biological causes through which the fertility of a woman has been limited to an average of about twelve children, the social causes which lead about one half of all women of childbearing age to remain unmarried, and the pathological and psychological causes which give the present family of two or three children. Answers had been received from 461 leading scientific men giving the causes which led to the limitation in the size of their families. One hundred and seventy-six were not voluntarily limited, while 285 were so limited, the cause of the voluntary limitation being health in 133 cases, expense in 98 cases and various other reasons in 54 cases. Childlessness was involuntary in two thirds of the cases. In the standardized family of two the condition is desired in six cases out of seven. In over one third of the families the limitation was involuntary, due to infertility and other pathological causes, but if these had not obtained, voluntary limitation would have occurred in nearly all or perhaps in all cases.

On the Effect of Adaptation on the Temperature Difference Limen: Edwina Abbott.

The effect of adaptation to different temperatures on the difference limen for 40° C., 37.5° C., 35° C., 32.5° C., 30° C., 27.5° C., 25° C., 22.5° C., 20° C. and 17.5° C. was determined. Water was used as the adaptation medium and was kept at any desired temperature by means of an electric heater controlled by an electric thermostat. The fingers of both hands of the subject were adapted to a certain temperature as far as the second joint and when adaptation was complete the fingers were raised and those of one hand dipped into water of the standard temperature and those of the other hand into water of the variable temperature for the difference limen test. The method of right and wrong cases was used in determining the limen and the fingers readapted before each test. Four trained subjects were used.

The results indicate that: (1) The difference limen for a given temperature after a given adaptation temperature is relatively constant for a given individual; (2) the absolute amount of the difference limen under such circumstances differs for individuals, but the relation between the limina for different temperatures after any given adaptation temperature remains the same for different individuals; (3) the point of greatest sensitivity to difference lies at 32.5° C.; (4) the preceding adaptation temperature affects the difference limen for a given temperature, the difference limen, in general, increasing as the adaptation temperature varies from the standard temperature; except for 32.5° C. where the difference limen remains constant under all conditions of adaptation.

Eventually to appear in the *Psychological Review,* Monograph Series.

A Study of the Behavior of the Chick: Ada Hart Arlitt.

In February of 1913 work suggested by that of Feré on the effect of alcohol on the physiological development of the chick was undertaken in the biological laboratory of Newcomb College. It was found possible to raise healthy chicks from eggs which had been subjected to alcoholic treatment, but the behavior of these chicks differed from that of normal chicks hatched in the same incubator at the same time.

The reactions to light and the pecking and drinking reactions of the abnormal chicks differed but little from those of normal chicks.

Abnormal and normal chicks were placed on stands from 10.7 cm. to 179 cm. above the box in which they were kept and the height at which they refused to jump recorded. The abnormal chicks jumped from greater heights.

To determine the difference in rapidity of learning three mazes were used, one a straight path blind at one end, one a simple choice maze with the exit on the left side, the third the Yerkes apparatus.

The chicks were given ten trials each in each of the first two mazes and the time taken to find the exit recorded. Abnormal chicks learned their way out of the first maze almost as swiftly as normal chicks, but learned their way out of the second much more slowly, making many wrong choices. Two failed to learn the way out.

With the Yerkes maze the number of trials taken before the chick made ten consecutive right choices was recorded. The exit was on the right side. The normal chicks learned the way to the exit in 8 trials, the abnormal in from 23 to 45 trials.

Two Factors which Influence Economical Learning: EDWARD K. STRONG, JR.

The paper presented the results of a number of experiments in the field of advertising and discussed their bearing upon studies that have been made in the field of economical learning.

The general conclusions were as follows: (1) Repetitions of advertisements a few minutes apart or a week apart are about equal in efficiency when tested four months later, but both such intervals are superior to repetitions a month apart. On the basis of all the work in this field, it would seem that the optimum interval for repetition is one day. (2) The more impressions made at one time, the less is the permanent retention of any one of them. This is probably due to the effect of retroactive inhibition. (3) In any situation when both length of interval and the number of impressions to be made at any one time are concerned, it should be borne in mind that the second factor is far more important than the first. This means that further work should be directed more particularly to a better understanding of how many impressions can be made to advantage at any one time, rather than to the proper interval of time between their successive presentations.

Published in the *Journal of Philosophy, Psychology and Scientific Methods*, Vol. XI., No. 5, February 26, 1914.

Psychological Characteristics of the African Negro: JEROME DOWD.

Professor Dowd divided Africa into economic zones, and contrasted the characteristics of the people of each zone.

"The instinct of flight is very pronounced in the banana zone. Nature is here manifested in a very violent form—exciting terror and gross superstitions. It is a zone of idols, fetichism, witchcraft and the magic-doctor. In the agricultural zones nature is less antagonistic, and the struggle for existence more severe, requiring more reason and courage. Here the emotion of fear is less pronounced—the number of idols diminishes, and the magic-doctor uses less hocus pocus and more medical art. In the cattle zone, where nature is still less violent and terrifying and the climate and other conditions more conducive to action, we observe still less fear among the people, less use of idols, witchcraft and magic-doctors.

"The instinct of pugnacity is weak in the banana zone because of the intensity of the feeling of fear. It is more pronounced in the agricultural zones, and very much so in the pastoral zones where the conditions provoke chronic warfare. This instinct is of great value to any race—since, under peaceful conditions, it is carried over into all lines of activity. Instead of the war of fire and sword, we have the war of tools, machinery, commodities and ideas. From the games played by children and adults up to the rivalry of nations for intellectual and moral supremacy we see the play of this primitive instinct. The nations that now occupy the highest rank in the industrial rank in intellectual and moral development are precisely those which have gone through the fiercest and most prolonged era of warfare.

"The gregarious instinct is remarkably developed in the central regions of Africa where the bounty of nature permits of the living together of large groups. It is not quite so well developed in the other zones, although it is everywhere very characteristic of the African Negro. In the lower stages of society this instinct serves the useful purpose of insuring to aggregations of people the development of laws and institutions. McDougall believes that this instinct is less important for civilized people and often produces anomalous and even injurious social consequences in large cities. According to Giddings and McDougall, this instinct is due to consciousness of kind. I believe, however, that people are attracted to each other by unlikeness, and the so-called instinct of gre-

gariousness is nothing but the expression of the instincts of fear and curiosity.''

Reason, imagination, inhibition and other characteristics were discussed.

A Comparison of White and Colored Children Measured by the Binet Scale of Intelligence: JOSIAH MORSE.

Two hundred and twenty-five white and one hundred and twenty-five colored children in the public schools of Columbia, S. C., were tested; ages ranging from six to twelve, inclusive. Results: The number of white children testing *at age* is decidedly larger than any other group, whereas for the colored children the largest group is the one testing one year below age. In the satisfactory group there is a difference of nearly 15 per cent. between the white and colored; nearly three times as many colored are more than a year backward, and less than one per cent. are more than a year advanced.

The picture tests, those relating to time and money, distinguishing between morning and afternoon, enumerating the months, counting stamps and making change, the drawing tests, both copying and reproducing from memory, were all too difficult. The answers to the questions of comprehension, to the absurd statements and to the problems of various facts, were often absurd or senseless; the best replies, however, compare favorably with those of the white children. The definitions were often not better than terms of use, and frequently stated in the language of a younger child.

Compared with the white, the colored children excelled in rote memory, *e. g.*, in counting, repeating digits—though not one was able to repeat 26 syllables—naming words, making rhymes, and in time orientation. They are inferior in esthetic judgment, observation, reasoning, motor control, logical memory, use of words, resistance to suggestion, and in orientation or adjustment to the institutions and complexities of civilized society.

A rough classification into three groups, according to color—dark, medium, light—showed that the darkest children are more nearly normal, the lightest show the greatest variation, both above and below normal.

The paper appeared in the January number of *Popular Science Monthly*, Vol. LXXXIV, No. 1, January, 1914.

A General Intelligence Test: L. R. GEISSLER.

Minor Studies in Learning and Relearning: DAVID SPENCE HILL.

The studies presented were from the standpoint of an instructor in educational psychology for college classes, and illustrate useful methods of individual and class experimentation. The studies consist of three series. The first is descriptive of material for and uses of mirror-drawing. One subject practised drawing stars for forty-eight days. Three years afterward the trials were resumed, and it was found that in about three trials the former speed and accuracy were attained. Analysis of the relearning does not show evidence that ''the mind continues its activity for a time in the furtherance of a learning process after practise and study have ceased,'' as suggested in the similar experiment of Swift.

In the mirror-drawing experiment, by initial and terminal tests before and after the above practise, an interesting demonstration was made of the regulation of transfer effect, both to right and left hands. This was accomplished by the use of slightly dissimilar geometrical figures, by the use of which there were found fairly consistent differences in net results of improvement.

The second study is a class experiment employing substitution tests. A group of ten students participated during twelve days. A presentation of the problems of intervals of study, the method of equal groups, the question of individual differences before, during, and after practise is included.

The third series consisted of cancellation experiments the object of which was to illustrate a convenient form of A-test suitable for group or individual use. In constructing the form, twenty-six marbles were marked with the letters of the alphabet, shaken in a small basket and thereupon a marble was withdrawn. After the letter was written down another mixing and withdrawal was made, and finally the MS. thus constructed was printed by a linotype. This method of distributing the twenty-six letters, although laborious, secured for practical purposes one hundred alphabets arranged in chance order. A group test during fourteen days was made upon the effect of practise in making A's and concerning the transfer of the improved capacity to marking words containing e and r, from a Latin text. The results are not inconsistent with those of Thorndike.

The paper will appear in the *Journal of Educational Psychology.*

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Acting Secretary, Section H